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FRAUNHOFER CENTER FOR MARITIME LOGISTICS AND SERVICES CML

NEWS
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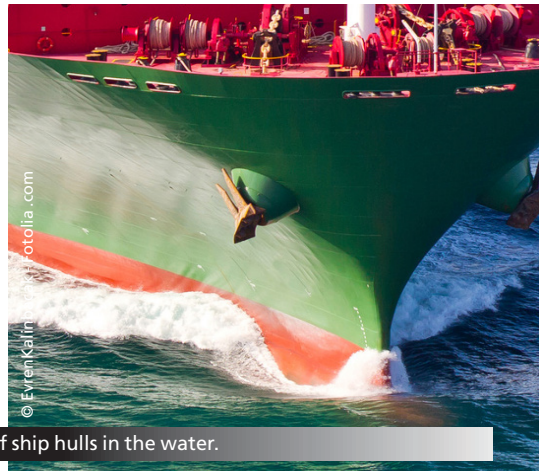

The properties of the floating fern Salvinia reduce resistance of ship hulls in the water.

BIOLOGICAL TRANSFORMATION
FOR SUSTAINABLE VALUE GENERATION

In the course of evolution, biology has created a multitude of solutions for the most diverse challenges of natural living environments. As such, it serves as a model: With its „Biological Transformation", the Fraunhofer-Gesellschaft is striving for the increasing application of materials, structures and principles of living nature in technology with the aim of creating sustainable value.

Our EU-funded AIRCOAT project, for example, involves the development of a new type of hull coating for ships, for which biology is a model. The special properties of the tropical floating fern Salvinia are used in the project. A foil imitating its properties is attached to the ship's hull and forms a thin layer of air when it comes into contact with water. This air lubrication effect reduces friction between the hull and the water, thus reducing pollutant and noise emissions. It also reduces biofouling processes and prevents the release of biocidal substances. The technology developed in the AIRCOAT project is an example of the successful application of bionics in industry and holds new opportunities for the marine coatings sector.

Another example is the BIOIN-SPACED project: the task of this project is to find biologically inspired approaches for the removal of space debris. The number of satellites and probes orbiting the Earth has grown rapidly in recent decades. Correspondingly, the number of defective objects, inoperable probes and satellites, or fragments after collisions has grown. This space debris endangers not only intact and future objects in Earth orbits, but also communications, weather services, and data collection on Earth. Additionally, it complicates manned spaceflight. ESA's Clean Space Initiative is therefore looking for solutions to the problem and has commissioned the CML to identify and analyze bionic concepts that can be used to collect the debris.

The bionic know-how that Fraunhofer CML has acquired in projects and use cases is also being made available to other companies in the maritime industry to examine conventional design and manufacturing methods for their biological transformation potential. CML experts examine new, innovative ways to improve products, increase efficiency, become more sustainable, or differentiate themselves from the competition. Nature as a creative solution provider: Bionics can steer thinking in entirely new directions and provide industry with unprecedented ideas. Find more information on our offer here.

INNOVATIVE CONCEPT WATER CARGO BARGE
BRINGS GOODS TO RIVERS AND CANALS IN HAMBURG?

Transport chains and flows of goods change over time, follow the needs of industry and commerce, and react to changing framework conditions. This is what makes logistics so attractive for many industry players, because efficient solutions and sensible innovations quickly find their way into implementation. In addition to economic and regulatory motives, ecological ones are also playing an increasingly important role, for customers as well as for transport service providers.

Our new project WaCaBa - short for Water Cargo Barge - takes advantage of these general conditions. WaCaBa aims to strengthen water transport and cargo handling on Hamburg's inner-city waters.

To this end, Fraunhofer CML is conducting a feasibility study for the Hamburg Authority for Economy and Innovation BWI. This study examines the suitability of the waterways and develops concepts for cargo handling solutions and the operation of autonomous watercraft by determining the demand for transport in various market segments. Economical operation of the WaCaBa is the goal.

The operation of the barges is intended to relieve inner-city roads and help reduce pollutant emissions from delivery traffic through modern propulsion systems.

Other European cities with inner-city waterways, such as Paris and Amsterdam, are already using barges in field trials to supply hotels and restaurants, for the CEP sector and other usage profiles.

An important prerequisite for the use of barges is the navigability of the waterways. Since many of them in Hamburg have been partially unused for years, their condition sets a tight framework for navigation and transhipment.

And last but not least, the barges and the associated handling facilities are to be operated for different requirements - a tricky task that the CML, supported by scientists from Fraunhofer IML, has now taken on.

FOREWORD

Dear readers,

Learning from nature and thus improving product development and value creation processes: that is what biological transformation is all about. In this newsletter, you can read examples of how the CML is systematically exploiting this potential and driving innovation. Join me in looking forward to other new solutions in the future - for example, the collection of maritime waste using bionic concepts.

Our feasibility study on the use of barges for freight transport in the Hamburg urban area has a strong regional focus. Will we find viable solutions to bring the city's maritime heritage to life?

And additionally, we report on our solutions for the further development of autonomous shipping. The installation of shore control stations, the remote control of harbor tugs and the implementation of the watch-free bridge are concepts that have already reached a very high level of realization.

I hope you enjoy reading this issue!

Yours,

Prof. Carlos Jahn
Director Fraunhofer CML

The watch-free bridge is intended to improve personnel deployment and safety in maritime shipping.

ON THE WAY TO THE AUTONOMOUS SHIP?
AUTOMATION IN MARITIME SHIPPING

We often hear the question of when autonomous ships will be underway. This is difficult to answer, because in addition to the technological implementation, many different questions are affected by the realization, which have to be solved by politics, administration and jurisdiction.
At the CML, we have already been working for 10 years on the development of technologies that advance the automation of maritime shipping since the initial EU-funded project MUNIN, a concept study on the challenges autonomous cargo ships must face. Our focus is on solutions that concentrate on monitoring, navigation and maneuvering support and are already applicable today.

Shore Control Station

The wide range of issues arising from the operation of an autonomous vessel already inspired the idea of deploying shore control stations in the MUNIN project. They should be able to monitor autonomously sailing ships from shore. By means of telemetry, relevant information about the current situation on board and the condition of the ship can be mapped and thus monitored, from nautical information about the traffic situation at sea, weather and wave conditions to the operating status of the machines and aggregates on board.
In the event of a malfunction or a critical situation, a shore control station can take over and steer the ship safely. The CML researchers have developed a further development of this remote monitoring and control system together with the Korean shipyard DSME, because the data generated on board a ship are of great interest for timely evaluation on shore in conventional shipping as well.

Watch-free bridge

New technologies can also provide support to relieve nautical personnel of routine tasks and increase safety. Actively linking the steering system to digital nautical charts enables a safe course to be determined, taking into account the applicable rules of way usage and collision avoidance. A prerequisite for this is the use of an autonomous navigation system that picks up and evaluates signals from other ships and objects in the area via AIS, RADAR and camera systems, for example.
In the event of a critical situation, the autonomous system can switch to an assistance mode or semi-autonomous operation and, by means of an alarm signal, make a proposal to the watchkeeping nautical officer for course or speed changes in accordance with the collision avoidance rules and adapted to the situation. Such a navigation system for a „watch-free bridge", that involves the nautical staff only when decisions are required, is being developed by the CML in the B ZERO project funded by the German Federal Ministry for Economic Affairs and Energy.

Maneuver Support

Autonomous docking and casting off maneuvers of large ships are not to be expected in the near future. The nautical and navigational requirements, which today are competently mastered by professionals such as pilots and tugboat captains, are too complex. Nevertheless, those responsible in the port see potential in digital support for these processes, because employment on tugs is dangerous and requires extensive know-how and experience, and, as in many other areas, there is a lack of junior staff to safely care for a growing number of ships with comparable intensity as before.
One solution to the situation may lie in the operation of remotely operated tugs: The valuable resource of „tug personnel" stays ashore and controls the tug with the aid of virtual reality (VR). In addition to the gain in safety, personnel resources can be used more effectively, because the previously required travel times on the tugs can be used for the maneuvers of increasing ship arrivals.
In the FernSAMS project, the CML has set new standards with the development of such a VR control system, together with project partners from industry and science. The project, led by Voith GmbH, has just been presented at the National Maritime Conference and has attracted a lot of attention there.
Even if the question of the realization of the autonomous ship has not now been definitively answered: research is working in various areas on the development of assistance systems that will make maritime shipping easier and safer. They have the potential to increase the efficiency of scarce and expensive resources and increase the productivity of maritime shipping. And that in the near future.

IN BRIEF

***Maritime Innovation Insights MII** - our annual lecture event was also held digitally this year. Many audience members welcomed the focus on our four research fields of shipping, shipbuilding, maritime logistics, and port, in order to learn specifically about new research topics. These included optimized crew planning, robotic assistance systems, hydrogen use in maritime logistics and digitalization in the port. Despite all the possibilities offered by digital events, we very much hope to celebrate our 5th anniversary of the MII with you in our new building next year!*

*The **ITS World Congress in Hamburg** is still planned as a presence event - and the CML will be there with live demonstrations of its autonomous research vehicle SeaML. At the Port of Hamburg, you will have the opportunity to see the various applications of our autonomously operating catamaran; from performing inspections and measurements on ship hulls and quay walls to autonomous maneuvering.*
The Fraunhofer-Gesellschaft also exhibits in the exhibition halls of Hamburg Messe and Congress. The CML will present its real port model to study data flows in digital processes, a planning table to illustrate IoT operations in maritime environments, and a miniature of the SeaML for visitors to try out.

+++DATES+++

- ***Maritime Innovation Update,** our digital lecture series, every Friday at 12 p.m.*
- ***ITS World Congress,** 11.-15. October 2021, Hamburg*

IMPRINT

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